CLAIMS

What is claimed is:

1   1.   A method of scheduling cable modems using virtual

2   upstream channels in a broadband communications system,

3   comprising:

4   segregating a transmission area reserved for said

5   virtual upstreams according to a first set of constraints;

6   and

7   enabling each of said cable modems to transmit data in

8   accordance with a second set of constraints and in

9   accordance with said segregation.

1   2.   A method according to claim 1 wherein said cable

2   modems are grouped by which virtual upstream channel they

3   belong to.

1   3.   A method according to claim 2 wherein said

2   transmission area is segregated by subdividing said

3   transmission area into a transmission sub-area for each

4   virtual upstream channel, the cable modems belonging to a

5   virtual upstream channel enabled to transmit only in its

6   corresponding transmission sub-area.

1   4.   A method according to claim 3 wherein each said

2   transmission sub-area occupies a contiguous portion of said

3   transmission area.

1   5.   A method according to claim 3 wherein each said

2   transmission sub-area is distributed and not contiguous

3   over said transmission area.

1   6.   A method according to claim 1 wherein said first

2   set of constraints is to provide optimal utilization of

3   said physical upstream channel by said cable modems.

1   7.   A method according to claim 1 wherein said second

2   set of constraints includes providing latency

3   differentiation among said cable modems.

1   8.   A method according to claim 6 wherein enabling

2   includes:

3   providing bandwidth allocation request messages to

4   said system.

1   9.   A method according to claim 8 wherein enabling

2   further includes:

3   converting said request messages to a unified form;

4   and

5   scheduling said requests in their unified form in

6   accordance with said second set of constraints.

1   10. A method according to claim 1 wherein information

2   elements in MAP messages are synchronized among all said

3   virtual upstream channels.

1   11. A method of scheduling cable modems using virtual

2   upstream channels in a broadband communications system,

3   comprising:

4   segregating a transmission area reserved for said

5   virtual upstreams according to a first set of constraints;

6   providing bandwidth allocation request messages to

7   said system;

8   converting said request messages to a unified form;

9   and

10   scheduling said requests in their unified form in

11   accordance with a second set of constraints.

1   12. A method according to claim 11 wherein said cable

2   modems are grouped by which virtual upstream channel they

3   belong to.

1   13. A method according to claim 12 wherein said

2   transmission area is segregated by subdividing said

3　transmission area into a transmission sub-area for each

4　virtual upstream channel, the cable modems belonging to a

5　virtual upstream channel enabled to transmit only in its

6　corresponding transmission sub-area.

1　　　14.　A method according to claim 13 wherein each said

2　transmission sub-area occupies a contiguous portion of said

3　transmission area.

1　　　15.　A method according to claim 13 wherein each said

2　transmission sub-area is distributed and not contiguous

3　over said transmission area.

1　　　16.　A method according to claim 11 wherein said first

2　set of constraints is to provide optimal utilization of

3　said physical upstream channel by said cable modems.

1　　　17.　A method according to claim 11 wherein said

2　second set of constraints includes providing latency

3　differentiation among said cable modems.

1　　　18. A method according to claim 11 wherein information

2　elements in MAP messages are synchronized among all said

3　virtual upstream channels.

1   19. An article comprising a computer-readable medium

2 having instructions stored thereon which when executed

3 cause:

4   segregating a transmission area reserved for said

5 virtual upstreams according to a first set of constraints;

6 and

7   enabling each of said cable modems to transmit data in

8 accordance with a second set of constraints and in

9 accordance with said segregation.

1   20. An article according to claim 19 wherein said

2 cable modems are grouped by which virtual upstream channel

3 they belong to.

1   21. An article according to claim 20 wherein said

2 transmission area is segregated by subdividing said

3 transmission area into a transmission sub-area for each

4 virtual upstream channel, the cable modems belonging to a

5 virtual upstream channel enabled to transmit only in its

6 corresponding transmission sub-area.

1   22. An article according to claim 21 wherein each

2 said transmission sub-area occupies a contiguous portion of

3 said transmission area.

1   23.   An article according to claim 21 wherein each

2   said transmission sub-area is distributed and not

3   contiguous over said transmission area.

1   24.   An article according to claim 19 wherein said

2   first set of constraints is to provide optimal utilization

3   of said physical upstream channel by said cable modems.

1   25.   An article according to claim 19 wherein said

2   second set of constraints includes providing latency

3   differentiation among said cable modems.

1   26.   An article according to claim 24 wherein enabling

2   includes:

3   providing bandwidth allocation request messages to

4   said system.

1   27.   An article according to claim 26 wherein enabling

2   further includes:

3   converting said request messages to a unified form;

4   and

5   scheduling said requests in their unified form in

6   accordance with said second set of constraints.

1   28. An article according to claim 19 wherein

2   information elements in MAP messages are synchronized among

3   all said virtual upstream channels.

1   29. An article comprising a computer-readable medium

2   having instructions stored thereon which when executed

3   cause:

4   segregating a transmission area reserved for said

5   virtual upstreams according to a first set of constraints;

6   providing bandwidth allocation request messages to

7   said system;

8   converting said request messages to a unified form;

9   and

10   scheduling said requests in their unified form in

11   accordance with a second set of constraints.

1   30. An article according to claim 29 wherein said

2   cable modems are grouped by which virtual upstream channel

3   they belong to.

1   31. An article according to claim 30 wherein said

2   transmission area is segregated by subdividing said

3   transmission area into a transmission sub-area for each

4   virtual upstream channel, the cable modems belonging to a

5 virtual upstream channel enabled to transmit only in its

6 corresponding transmission sub-area.

1   32. An article according to claim 31 wherein each

2 said transmission sub-area occupies a contiguous portion of

3 said transmission area.

1   33. An article according to claim 31 wherein each

2 said transmission sub-area is distributed and not

3 contiguous over said transmission area.

1   34. An article according to claim 29 wherein said

2 first set of constraints is to provide optimal utilization

3 of said physical upstream channel by said cable modems.

1   35. An article according to claim 29 wherein said

2 second set of constraints includes providing latency

3 differentiation among said cable modems.

1   36. An article according to claim 29 wherein

2 information elements in MAP messages are synchronized among

3 all said virtual upstream channels.